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ABSTRACT

This paper analyzes the age composition of Pennsylvanians. An analysis by specific age groups shows the types of pressure that will be exerted on both basic and higher education. In conducting the analysis, the following are closely examined: age bracket 5-15 years in relation to elementary enrollment, age bracket 14-17 in relation to secondary enrollment, age bracket 18-22 in relation to colleges and universities, age 22 as a source of persons entering the job market as teachers in basic education, and age bracket 35-44 in relation to nontraditional students who may be searching for education retraining opportunities under the pressure of the anticipated job-promotion squeeze caused when the 1975 bulge of 20-24 year olds attains this age. The decline in the elementary population should bottom out in 1985, in secondary in 1990, and in the higher education population in 1995. While the schools find themselves under the stress of declining enrollment, Pennsylvania will also face pressure on the job market due to a sudden increase in the number of persons aged 20-34 in the 1980s. (Author/IRT)

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# The Changing Age Structure of Pennsylvania's Population and Its Implications for Educational Planning

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Demographic Series

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## FOREWORD

The writers extend their gratitude to George Brehman and William Donny, especially to Dr. Brehman for his suggestions.

The interpretations presented in this paper are Seon Cho's professional opinions and are not to be construed as reflecting the policy position of the Pennsylvania Department of Education.

This paper proposes to analyze the age composition of Pennsylvanians and to demonstrate how this analysis would help educational decision-makers spot future problems in both basic and higher education.

We have simplified our presentation to help the reader get a feel for the demographic changes taking place and their implications for educational practice in the future. By doing this we hope to evoke in our readers questions relative to their own frame of reference.

By informing the reader of impending changes in the age structure through the use of statistical summaries and graphs, we hope the reader learns how to spot present or future areas of difficulty and raise penetrating questions relative to demographic pressures on the educational sector. We have purposely not made any policy recommendations, nor have we attempted to single out specific problems. This paper is designed to help the reader focus on demographic analysis and help the reader to draw important implications relative to his/her own unique situation.

## I. Age Pyramid of Pennsylvanians: Today and Near Future

A study of the current age structure provides a clue to trouble in the years ahead. By examining and then projecting the number of persons in each age category, we can spot the future direction of related changes in socio-educational services. For example, today's sudden decrease in births clearly indicates there will be excess capacity in the basic education sector in years to come. Similarly, a population bulge for age group 20 through 34 in 1985 will certainly exert pressure on the job market at that time. Although these examples are grossly simplified, they help us get a feel for the direction that educators and society may have to take in the years ahead.

A projection of age structure on the basis of today's census is, in fact, fairly accurate; and any implied changes are to a large extent irreversible. Those born now will go through successive stages of maturity. They will go to school and from school to the job market and from the job market to retirement. Projecting the number of births is, of course, subject to some error, since we must make assumptions about change in the birth rate. The analysis of future age structures, on the basis of known birth statistics, however, makes possible relatively accurate projections for our use.

The most salient features of 1975's Pennsylvania population structure are (1) a large bulge in age group 10 through 24 and (2) a narrowing pinch for children under 10 years of age.[1]

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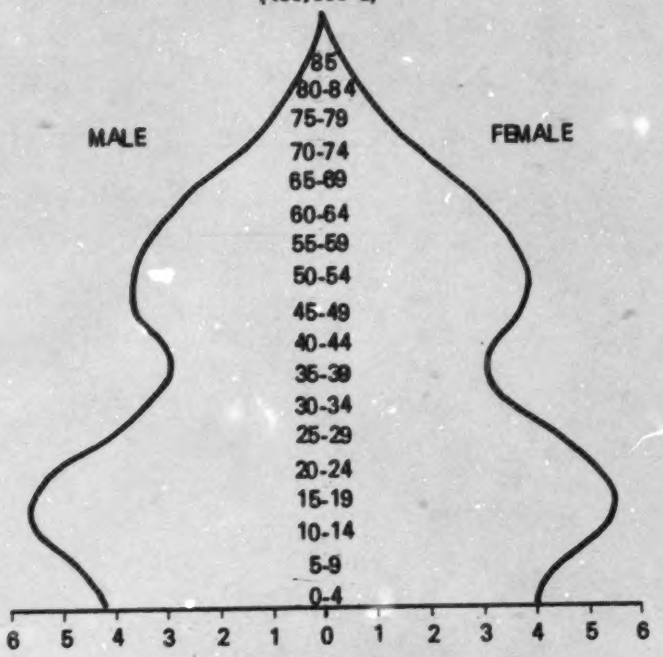
[1] Population Projections for Pennsylvania and Counties 1970-2000, John Senier, Division of Research, Bureau of Information Systems, Pennsylvania Department of Education, September 1975.

FIGURE 1
PROJECTED 1975 AGE STRUCTURE OF PENNSYLVANIA'S POPULATION
(100,000's)




| | |
|---|---|
| Male | 5,730,037 |
| Female | 6,249,657 |
| Total | 11,979,694 |

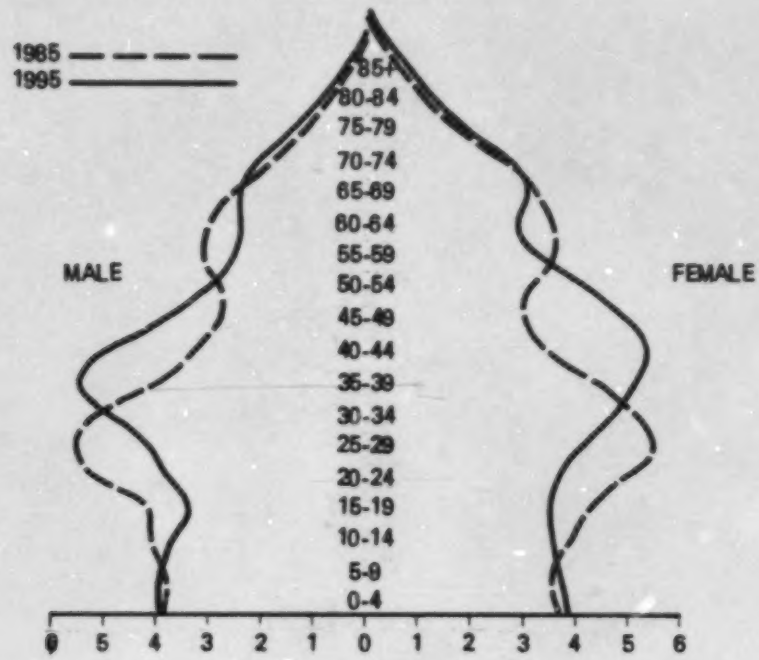
By eye-balling the 10-24 bulge in Figure 1, we can trace the wave of population pressure that began in the baby boom of the 50s and reached a crest with children who reached school age in the 60s and the early 70s. This movement of the bulge upward has crowded the schools for the last two decades. Some of them became job seekers in the early 70s, but the majority are still in school. As can be seen, their impact on the schools will soon lessen, and the job market will bear the brunt of their numbers.

The age pyramid in Figure 1 helps the reader see the kinds of pressures that may be generated through the moving waves of change in the age structure of Pennsylvanians. This graph shows the number of males and females in each age category. The scale at the bottom indicates the number of females from center to the right, and the number of males from the center to left. The horizontal population scale at the bottom is expressed in 100,000s. The scale in the center, from the bottom to top, shows the various age brackets. By picking the age group 0-4, for instance, we can see there are about 400,000 females and slightly more than 400,000 males in Pennsylvania as of 1975.

How will the age pyramid of 1975 change in 10 or in 20 years? Figure 2 gives the age pyramids of 1985 and 1995 and illustrates the successive movement

of the bulge from 10-24 years old in 1975 to 20-34 years old in 1985.[2] This bulge then becomes age group 30-44 years old in 1995. At the same time, the pinch in the birth-to-school-age group is persisting and getting narrower by 1985. We may continue to find a pinch in 1995, despite the appearance of babies born to parents who themselves were part of a baby boom.

FIGURE 2
PROJECTED AGE STRUCTURE OF PENNSYLVANIA'S POPULATION
(100,000's)




| | 1985 | 1995 |
|---|---|---|
| Male | 5,739,380 | 5,714,775 |
| Female | 6,333,784 | 6,336,959 |
| Total | 12,073,164 | 12,051,734 |

What do this successive movement of the baby boom bulge to the top and the elongated pinch at the bottom tell us? How do these changes suggest the changes in education?

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[2]Ibid.

(a) The leading edge of the largest bulge (10-24 years old) came out of the schools in 1975 and started to flood the job market. However, the majority of the young people represented by that bulge were still in the schools at that time.

(b) This bulge will become the 20-34 year olds in 1985. They will then overcrowd the job market even more severely than was the case in 1975.

(c) The same bulge will then move up to the age bracket of 30-44 years old by 1995. The sheer size of this age group will put a severe squeeze on opportunities for career advancement and will consequently compel people in this age bracket to seek mid-life career redirection.

What effects would such a crowded job market and the consequent job-promotion squeeze have on educational institutions? Would education have to bear more of the burden of skill training and preparation for leisure activity to relieve this pressure? How would today's adult and continuing education curricula and practices have to change under such pressures?

Another apparent feature of the age pyramid in 1975 is the elongated pinch in the age range of birth to school age. This pinch tells us there will be fewer and fewer school-aged children in the population until at least 1985. Although the baby boom will increase the number of childbearing women in the 80s (and thus births may increase in the 90s), it is certain that the number of school-aged children will decline continuously until 1985.

This elongated pinch in school-aged population spells trouble for the education sector. The dearth of children during the mid-70s will cause a decline in enrollment along with an accelerated cost pressure on the basic education sector until 1985. This decline will cause profound dislocation in colleges and universities from 1980 to 1995. We will now explore further the implications of a changing age structure in relation to Pennsylvania's total educational sector.

## II. Analysis of Age Structure and Its Implication Upon Educational Planning

Having gotten a feeling for the pressure generated by the pattern of movement from baby boom to baby bust, we will now present an analysis by specific age groups to show more clearly the types of pressure that will be exerted on both basic and higher education. In doing this, we will closely examine the following:

- Age bracket 5-13 years in relation to elementary enrollment.
- Age bracket 14-17 in relation to secondary enrollment.
- Age bracket 18-22 in relation to colleges and universities.

- o Age 22 as a potential source of persons entering the job market as teachers in basic education.

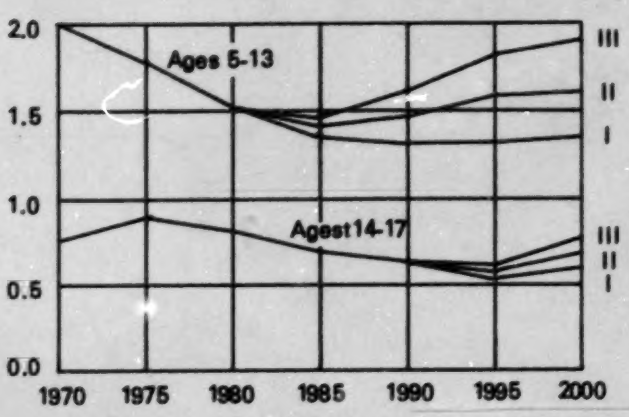
- o Age bracket 35-44 in relation to nontraditional students who may be searching for educational retraining opportunities under the pressure of the anticipated job-promotion squeeze mentioned earlier.

A. Declining Enrollment in Basic Education

The graph in Figure 3 projects population in age bracket 5-13 and age bracket 14-17 and shows the magnitude of decline in both the elementary and the secondary school-aged populations respectively. There will be over a half million decline in the elementary age group from 1970 to 1980, and this decline will continue until 1985. The secondary school-aged population started to decline in 1975, a trend which is likely to continue until 1995.

We estimate that when these two are combined there will be 900,000 fewer students enrolled in basic education (K-12) in 1985 than the 2.9 million in 1970. This decline is actually about one-third of the schools' 1970 capacity. How basic education in Pennsylvania will adapt its institutional operations under such conditions is a critical question, since it is certain that basic education enrollments will decline, at least until 1985.

FIGURE 3
PROJECTED POPULATION AGES 5-13
IN PENNSYLVANIA: 1970-2000
(Millions)

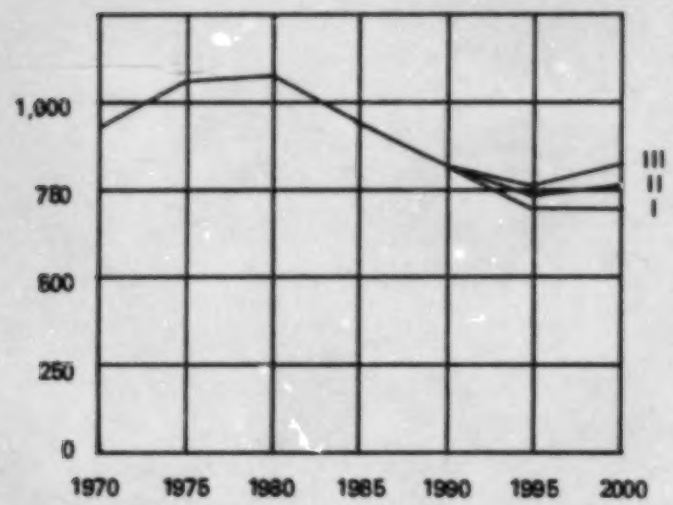



I Fertility rate stabilizes at 1.67
II Fertility rate increases to 2.11 by 1980 (zero population growth)
III Fertility rate increases to 2.5 by 1980

B. Decline of Traditional College-Aged Population and an Increase of the Middle-Aged

Figure 4 presents the number of persons in age bracket 18-22 from 1970 through 2000. Decline in this age group will start in 1980 and continue to 1995. The magnitude of decline, from over 1.2 million in 1980 to less than 750,000 in 1995, would exert great pressure on the colleges since this age group is the primary source of enrollments. The declining proportion of high school graduates going to college will add further to the decline in the college enrollment picture.[3] In contrast, the upsurge in the number of 35-44 year olds between 1980 and 1995 may present a very different challenge to the institutions of higher education in Pennsylvania.

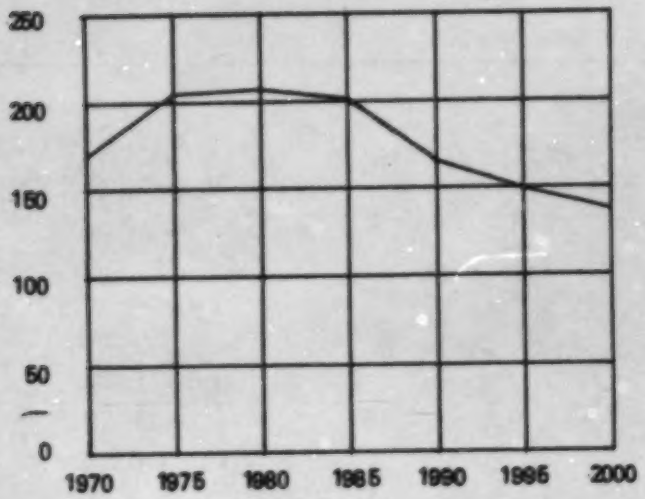
FIGURE 4
PROJECTED POPULATION AGES 18-22
IN PENNSYLVANIA: 1970-2000
(1,000's)




I Fertility rate stabilizes at 1.67
II Fertility rate increases to 2.11 by 1980 (zero population growth)
III Fertility rate increases to 2.5 by 1980

[3] Ibid.

FIGURE 5
PROJECTED POPULATION AGE 22
IN PENNSYLVANIA: 1970-2000
(1,000's)




C. Decline in the Number of 22-Year Olds and in the Supply of Teachers in Basic Education

The oversupply of teachers in basic education during the mid-70s has generated an employment squeeze for graduates of schools of education. For example, in 1975 a follow-up study of college graduates showed that only 52 per cent of the education majors were placed as teachers.[4] Although fewer students are now entering schools of education, in response to the economic law of supply and demand, we nevertheless believe that the employment picture for trained teachers in basic education will remain bleak until at least 1985.

Traditionally, 22-year olds are the ones who enter teaching in basic education. The number of persons in this age category will decline rapidly between 1985 and 1995. This decline will coincide with a probable increase in elementary enrollment because baby-boom parents will now be having children. Because of the tight job market in the early 70s and the relative youth of today's teachers, employed teachers will tend to stay in their jobs and there will be little need to hire new teachers. Therefore, each year the

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[4]Our Colleges and Universities Today: The Preparation and Occupational Pursuits of Elementary, Secondary and Ungraded Teachers 1974-75, Division of Educational Statistics, Bureau of Information Systems, Pennsylvania Department of Education, Vol. XIII, No. 5 (1976).

average age of tenured teachers will increase. The median age of 1975-76 Pennsylvania teachers is 33.1 years.[5] A substantial portion of today's teachers (10 per cent) will have retired by 1985. This means that we will need more teachers in 1985, but the supply of the traditional source of teachers (22-year olds) will have declined. This phenomena may will produce a mini teacher shortage in the late 1980s or later, since by 1995 some 24 per cent (27,946) of the 1975-76 teachers will have retired. That rate of retirement is about double the rate of retirement today.

D. Increase of the Childbearing Age Group in 1980-1990

The number of women between ages 18 and 34 will increase to 1,728,000 by 1980; that represents an increase of 182,500 over the number of childbearing age women today (1975).[6] Although some decline will occur, there will still be 1,642,000 in 1990.[7] This will still be 6.6 per cent greater than the number of childbearing age women in 1976. Any increase in the fertility rate would generate a mini baby-boom in the mid-80s. For example, a fertility rate of 2.11 constitutes zero population growth. Growth at this level would nevertheless increase births to a level comparable to that of 1970. A fertility rate of 2.5 would produce a mini baby-boom comparable to that of the early '60s. Figure 6 gives birth projections based on three fertility rates.

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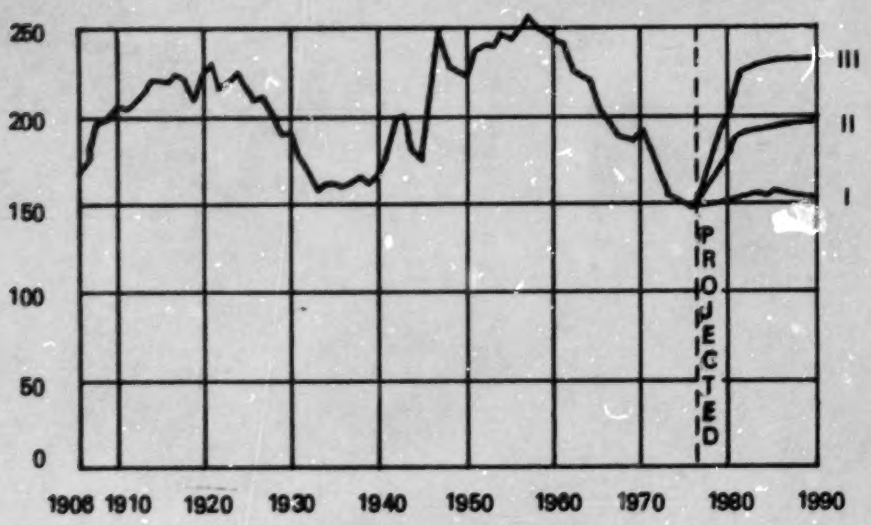
[5]Our Schools Today: Professional Personnel Report 1975-76, Division of Educational Statistics, Bureau of Information Systems, Pennsylvania Department of Education, Vol. XV, No. 6 (1976).

[6]John Senier, Op. Cit.

[7]Ibid.

FIGURE 6
RESIDENT LIVE BIRTHS IN PENNSYLVANIA:
1906-1990
(1,000's)




I Fertility rate stabilizes at 1.67
II Fertility rate increases to 2.11 by 1980 (zero population growth)
III Fertility rate increases to 2.5 by 1980

III. Summary and Implications of Pennsylvania's Age Structure: Today and in the Near Future

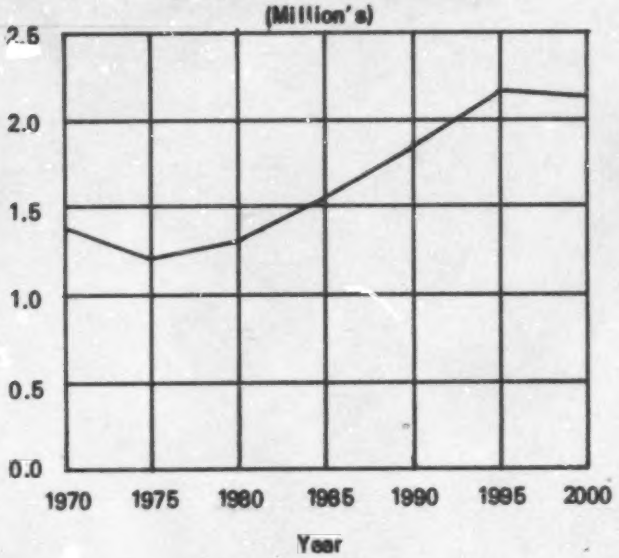
A decline of the school-aged population is already apparent. This trend will continue and will almost certainly exert severe pressure on elementary, secondary and higher education. A summary of its likely impact is presented in the following[8]:

| | Year to Start Decline | Year of Bottoming Out | Magnitude of Decline | Possible Effects |
|---|---|---|---|---|
| Elementary | 1970 | 1985 | (33%) | (1) excess buildin and staff |
| Secondary | 1975 | 1990 | (36%) | |
| College/Univ. | 1980 | 1995 | (31%) | (2) program change to nontraditio adult and cont uing education needs, etc. |

[8] Ibid.

While the schools will find themselves under the stress of declining enrollments, Pennsylvania will also face different pressure on the job market due to a sudden increase in the number of persons aged 20 to 34 in the '80s. As this very large group gets older (see Figure 7), the employment problem may shift to one of a job promotion squeeze and frustration, leading to a high level of mid-career changes in the '90s.

FIGURE 7
PROJECTED POPULATION AGES 35-44
IN PENNSYLVANIA: 1970-2000
(Million's)




Furthermore, the number of senior citizens (65 and over) will have doubled between 1950 and 1990.[9] This in itself may cause difficulties for education, since the over-65 group's needs (health care, retirement benefits, etc.) may require a major infusion of resources in order to deliver the services. This large over-65 age group could become a potent political force which competes with education for scarce tax dollars and may oppose increases in school funding and support priorities other than education.

[9]Ibid.

## Selected Demographic Information for Pennsylvania (1950-1990)

| Age | 1950 Census | 1955 Estimated | 1960 Census | 1965 Estimated | 1970 Census | Projected 1975 | 1980 | 1985 | 1990 |
|---|---|---|---|---|---|---|---|---|---|
| 5 | 167,630 | 213,234 | 232,835 | 238,204 | 208,048 | 184,185 | 148,315 | 152,205 | 149,420 |
| 6 | 178,455 | 216,179 | 225,332 | 239,712 | 213,598 | 177,360 | 150,695 | 150,235 | 148,515 |
| 7 | 192,255 | 222,888 | 222,878 | 243,329 | 214,891 | 178,015 | 152,415 | 148,260 | 147,615 |
| 8 | 169,380 | 232,546 | 214,658 | 243,747 | 219,441 | 180,880 | 161,755 | 146,290 | 146,710 |
| 9 | 154,090 | 190,354 | 202,785 | 239,555 | 226,777 | 187,745 | 178,670 | 144,925 | 145,810 |
| 10 | 151,175 | 166,698 | 204,834 | 230,626 | 235,309 | 206,995 | 183,275 | 147,580 | 151,450 |
| 11 | 150,145 | 177,451 | 207,777 | 223,942 | 232,809 | 212,515 | 176,500 | 149,965 | 149,505 |
| 12 | 155,105 | 187,687 | 218,549 | 221,258 | 236,848 | 213,795 | 177,145 | 151,670 | 147,535 |
| 13 | 147,940 | 158,353 | 216,580 | 213,662 | 232,496 | 218,305 | 179,985 | 160,955 | 145,565 |
| 14 | 144,025 | 141,812 | 162,332 | 197,472 | 231,092 | 225,595 | 186,805 | 177,775 | 144,200 |
| 15 | 146,480 | 137,752 | 165,767 | 193,438 | 228,416 | 233,050 | 206,120 | 182,500 | 146,955 |
| 16 | 142,505 | 138,735 | 176,447 | 190,331 | 222,552 | 231,365 | 211,610 | 175,750 | 149,330 |
| 17 | 142,710 | 138,845 | 183,120 | 198,964 | 219,638 | 225,110 | 212,875 | 176,380 | 151,015 |
| 18 | 147,460 | 134,025 | 147,327 | 198,924 | 212,665 | 231,410 | 217,315 | 179,170 | 160,225 |
| 19 | 148,135 | 132,760 | 129,534 | 149,591 | 192,159 | 224,875 | 224,590 | 185,970 | 176,980 |
| 20 | 148,165 | 135,720 | 124,330 | 152,876 | 182,041 | 221,125 | 217,550 | 198,040 | 175,345 |
| 21 | 160,585 | 131,808 | 127,325 | 161,755 | 172,886 | 215,450 | 215,265 | 203,335 | 168,875 |
| 22 | 162,355 | 135,949 | 122,584 | 169,651 | 179,379 | 212,630 | 218,985 | 204,545 | 169,475 |
| Total | 2,808,595 | 2,992,796 | 3,284,994 | 3,707,037 | 3,861,045 | 3,790,405 | 3,419,870 | 3,035,550 | 2,774,525 |
| 5- 17-Year-Olds | 2,041,895 | 2,322,534 | 2,633,894 | 2,874,240 | 2,921,915 | 2,684,915 | 2,326,165 | 2,064,490 | 1,923,625 |
| Number Students in K-12 | * | 2,196,728 | 2,529,954 | 2,807,421 | 2,880,968 | 2,674,187 | 2,293,400 | 1,988,900 | 1,896,700 |
| Working Age Population (18-64) | 6,554,720 | 6,465,265 | 6,375,805 | 6,524,745 | 6,673,681 | 7,063,493 | 7,338,111 | 7,492,010 | 7,543,382 |
| Population Ages 65+ | 886,825 | 1,007,675 | 1,128,525 | 1,200,325 | 1,272,125 | 1,453,978 | 1,625,842 | 1,803,479 | 1,885,224 |
| Ratio 65 and Over to 18- 64-Year-Olds | 13.5% | 15.6% | 17.7% | 18.4% | 19.1% | 20.6% | 22.2% | 24.1% | 25.0% |

*Information on nonpublic school enrollments was not collected prior to 1953.